REMARKS/ARGUMENTS

In the final rejection, claims 1-7 and 12-18 are rejected under U.S.C 102(b) as being anticipated by Harkin et al. (US 5,705,413). Claims 10-11 and 21-22 are rejected under U.S.C 103(a) as being unpatentable over Harkin et al. (US 5,705,413) in view of Kawasaki et al. (US 6,426,245).

1. Correction of claims 14-15:

Claims 14-15 are amended for correcting translation error, which are added with the limitation of "after forming the polysilicon film" to clearly define when the heat-retaining layer is removed, according to paragraphs [0021] and [0022], and Fig.7 of the present application. No new matter is introduced. Acceptance of the amended claims 14-15 is politely requested.

2. Regarding the Advisory action, dated 03/11/2005:

The request for reconsideration has been considered but dose NOT place the application in condition for allowance because: the arguments are not persuasive. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., a chemical vapor deposition process is performed to form a heat-retaining capping layer being used to reduce the heat dissipation rate in the crystallization process and maintain the amorphous silicon film in a higher temperature environment; the amorphous silicon film is not directly exposed under the laser) are not recited in the rejected claims. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims.

Response:

A description amendment is made in the amended claims 1 and 12 according to the specification of paragraphs [0011] and [0018], paragraph [0019], lines 9-11, paragraph [0022], and Figs. 5 and 8 for more clearly defining the method of fabricating a polysilicon film through a heat-retaining capping layer. No new matter is introduced.

As a proposed response to the Advisory action, a Request for Continued Examination (RCE) is submitted. Reconsideration of the amended claims 1 and 12 is hereby requested.

3. Claims 1-7 and 12-18 are rejected under 35 U.S.C 102(b) as being anticipated by Harkin et al. (U.S 5,705,413):

Harkin et al. teaches a method of forming a polysilicon film by an excimer laser crystallization process (Abstract). Harkin et al. shows providing a substrate (having a buffer layer) defined with a first region and a second region (Fig.1-2, col. 7, lines 1-25, col.10, lines 1-10). Harkin et al. discloses forming an amorphous silicon film on the substrate, forming a mask layer on the amorphous silicon film, performing a first photo-etching process to remove the mask layer on the first region (Fig. 3-5, 13-14, col. 5, lines 50-65 col. 6, lines 1-20, col. 7, lines 24-67, col. 12, lines 49-67, col. 13, lines 1-17). Harkin et al. teaches forming a heat-retaining capping layer covering the mask layer and the amorphous silicon film (Fig. 3-5, col. 7, lines 40-67).

Furthermore, Harkin et al. shows performing the excimer laser crystallization process to make the amorphous silicon film in the first region crystallize to a polysilicon film (Fig. 5, col. 6, lines 1-20, col. 8, lines 9-25). Harkin et al. discloses an etching process to remove the heat-retaining layer, the mask layer, and to etch the portions of the amorphous film after forming the polysilicon film (Fig. 13-14, col. 4,lines 24-35, col. 9, lines 40-45, col.13, lines 1-17). Harkin et al. teaches the mask layer and the heat-retaining capping layer comprising silicon oxide, silicon nitride, silicon oxynitride or a metal (col. 3, lines 47-50, 63-67, col. 4, lines 1-4).

In addition, Harkin et al. describes the masking pattern (20,21) having a thermally-stable absorbent layer or reflective inorganic material and an insulating layer having sufficient thickness to mask the amorphous film. Therefore, Harkin et al. anticipated both recitations: forming a heat-retaining capping layer covering the mask and forming a mask layer on the heat-retaining capping layer (Abstract, col. 2, lines 58-67, col. 3, lines 1-5, col.3 lines 25-67, col. 4, lines 1-24). In addition, the elements

must be arranged as required by the claim, but this is not an ipsissimis verbis test, i.e., identity of terminology is not required. In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

Response:

The amended claims 1 and 12 of the present application are listed in the following with clear version:

"Claim 1: A method of fabricating a polysilicon film by an excimer laser crystallization process, the method comprising following steps:

providing a substrate defined with a first region and a second region;

forming an amorphous silicon film on the substrate;

forming a mask layer on the amorphous silicon film;

performing a first photo-etching process to remove the mask layer in the first region;

forming a heat-retaining capping layer covering the mask layer in the second region and the amorphous silicon film in the fist region; and

performing the excimer laser crystallization process to make the amorphous silicon film, covered by the heat-retaining capping layer, in the first region crystallize to a polysilicon film."

"Claim 12: A method of fabricating a polysilicon film by an excimer laser crystallization process, the method comprising following steps:

providing a substrate defined with a first region and a second region;

forming an amorphous silicon film on the substrate;

forming a heat-retaining capping layer covering the amorphous silicon film in both of the first region and the second region;

forming a mask layer on the heat-retaining capping layer;

performing a first photo-etching process to remove the mask layer in the first region and *expose the heat-retaining capping layer in the first region*; and

performing the excimer laser crystallization process to make the amorphous silicon film, covered by the heat-retaining capping layer, in the first region crystallize

to a polysilicon film."

As disclosed in the amended claims 1 and 12 of the present application, when performing the excimer laser crystallization process, the amorphous silicon films 114, 214 in the first region 120, which are predetermined to be formed as polysilicon films, are *directly covered by the heat-retaining capping layers 118, 216*, as shown in Figs. 5 and 8. Therefore, *when performing the excimer laser crystallization process, the amorphous silicon film 114 is not directly exposed under the laser but is covered by the heat-retaining capping layer 118*. Since the heat-retaining capping layer 118 can reduce the heat dissipation rate in the crystallization process and maintain the amorphous silicon films 114, 214 in a higher temperature environment for more time, the present application has a obviously advantage that the fabricated polysilicon film has increased grain size effectively (paragraph [0019], lines 7-12, paragraph 0023, lines 1-4).

According to Harkin's disclosure, a semiconductor film 1 is formed on an insulating substrate 10. Then a barrier insulating layer 20 and a masking pattern of thermally-stable absorbent or reflective inorganic material 21 is sequentially formed on the semiconductor film 1 (Fig. 3, 13, col. 6, lines 10-11, col. 7, lines 40-48, col. 12, lines 59-65). Before exposing the first portion 1a of the semiconductor film 1 to the energy beam, the barrier insulating layer 20'and the inorganic material 21' are removed from the first portion 1a of the semiconductor film 1 (Fig. 4-5, col. 6, lines 12-19, col. 7, lines 50-58, col. 12, lines 64-67, col. 13-14, lines 6-9). After that, the energy beam 25 is used to define the first and second portions 1a and 1b of different crystallinity (col. 6, lines 20-25, col.7, lines 61-63). Accordingly, *the un-masked first portion 1a of the semiconductor film 1 is directly exposed under the energy beam 25 during the crystallization process for crystallizing the un-masked first portion 1a of the semiconductor film 1 to become a polysilicon film* (col. 5, lines 60-64). Furthermore, the diffusion barrier 20 is against adverse effects of heat diffusion or impurity diffusion from the masking pattern of inorganic material (col. 3 lines 47-62), and the inorganic masking pattern 21 is stable with this laser beam and reflects the laser beam 25 from over the film portions 1b which are not to be crystallized (col. 7,

lines 63-67, col. 8, lines 35-40). Thus, absolutely, *the Harkin's disclosure never teaches to use a heat-retaining capping layer to cover the amorphous film, which is predetermined to form a polysilicon film, for maintaining the semiconductor film in a higher temperature environment. On the other words, the amorphous film predetermined to form a polysilicon film of the Harkin's disclosure is directly exposed under the energy beam, but that of the present invention is covered by the heat-retaining capping layer under the energy beam so as to increase the grain size of the polysilicon film and improve the performance of devices.*

From the above discussion, the Applicant believes that the amended claims 1 and 12 of the present application are absolutely different from the Harkin's disclosure. Reconsideration of the amended claims 1 and 12 is therefore requested. Claims 2-7 and 13-18 are dependent upon claim 1 and claim 12, and they should be allowed if the amended claim 1 and claim 12 are allowed. Reconsideration of claims 2-7 and 13-18 is therefore requested.

4. Claims 10-11 and 21-22 are rejected under 35 U.S.C 103(a) as being unpatentable over Harkin et al. (U.S. 5,705,413) in view of Kawasaki et al. (U.S 6,426,245):

Regarding claims 10-11 and 21-22, Harkin et al. does not specifically show the long duration laser having a period in a range of about 150 to 250 ns. However, Kawasaki et al. teaches the excimer laser having a period form several nanoseconds through several hundred nanoseconds (col. 4, lines 58-67).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to specify any desired period on Harkin et al. reference as taught by Kawasaki et al. in order to optimize the laser conditions and better control the crystallizing growth (Kawasaki et al., col. 4, lines 58-67).

In addition, it is the examiner's position that the period in a range of about 150 to 250 ns it is not critical to the invention. Therefore, "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or

workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Response:

Claims 10-11 and 21-22 are dependent upon claim 1 and claim 12, and they should be allowed if claim 1 and claim 12 are allowed. Reconsideration of claims 10-11 and 21-22 is therefore requested.

5. Claims 8-9 and 19-20:

Examiner hasn't mentioned about the situation of claims 8-9 and 19-20. Claims 8 and 19 describes that the excimer layer crystallization process uses an excimer laser to irradiate the amorphous film to make the amorphous silicon film in the second region covered with the mask layer become partially melted, and make the amorphous film in the first region, not covered with the mask layer, become completely melted, so that grains can grow laterally toward the first region from the interface between the first region and the second region so as to form a polysilicon film in the first region. Claims 9 and 20 describe that the heat-retaining capping layer is used to decrease the heat dissipating rate of the amorphous silicon film for increasing the size of the grains formed in the excimer laser crystallization process. Referring to disclosures of the cited prior-art application, neither Harkin et al. nor Kawasaki et al. teach or clearly mention about the characteristics listed in claims 8-9 and claims 19-20. Therefore, the Applicant believe claims 8-9 and 19-20 are allowable.

Furthermore, claims 8-9 and claims 19-20 are dependent upon the amended claim 1 and 12. Therefore, if the amended claim 1 and 12 are allowed, claims 8-9 and 19-20 should be allowed. Accordingly, allowance of claims 8-9 and 19-20 is politely requested.

6. Introduction of New Claims:

Claims 23-26 are introduced for further describing the present application according to paragraph [0019], lines 9-14, paragraph [0023], lines 1-4, and Figs. 5-8. Claims 23 and 25 have the limitation of that the amorphous silicon film in the first

region, which is predetermined to be a polysilicon film, is not directly exposed under the excimer laser and is covered by the heat-retain capping layer when performing the crystallization process; and claims 24 and 26 describes that the heat-retaining capping layer is used to reduce the heat dissipation rate in the crystallization process and maintain the amorphous silicon film in the first region in a higher temperature environment when performing the excimer laser crystallization for increasing grain sizes of the polysilicon film. The Applicant believes none of the limitations listed in claims 23-26 are disclosed in Harkin's or Kawasaki's disclosure. Acceptance of the new claims 23-26 is politely requested.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Sincerely yours,

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